

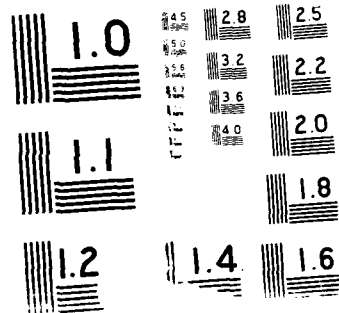
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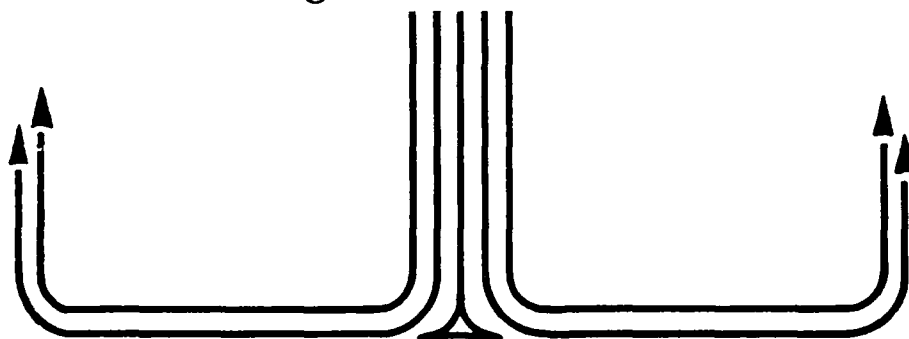
AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

FUTURE AIR-TO-AIR TRAINING FOR THE RF-4

MAJOR JOHN W. DRAIN, USAF 88-0780

"insights into tomorrow"



1. SUMMARY
2. INTRODUCTION
3. BACKGROUND
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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This study examines the adequacy of current RF-4 upgrade and continuation training programs if the AIM-9L is mounted on the RF-4 and two-ship formation tactics are increasingly employed. Current training at Lead-In Fighter Training (LIFT) and the RF-4 Operational Training Course (OTC) are shown to inadequately train crewmembers in the air-to-air skills they require. This study proposes a new RF-4 OTC air-to-air program based on the air-to-air phase of the F-4 OTC syllabus. Mission Qualification Training (MQT) and Continuation Training (CT) are shown to inadequately maintain the air-to-air skills taught at LIFT and the OTC. Changes to the MQT syllabus and CT program are proposed. The result is a complete training program for the RF-4 crewmember in offensive and defensive Basic Fighter Maneuvers (BFM) and defensive Air Combat Maneuvers (ACM).					
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PREFACE

Due to more sophisticated weapon systems fielded by our adversaries, the threat to tactical reconnaissance aircraft from surface-to-air missiles, anti-aircraft artillery, and air-to-air interceptors continues to increase each year. While discussions continue for a follow-on tactical reconnaissance fighter to replace the RF-4, improvements to the RF-4 must be made to ensure combat survivability for tactical reconnaissance in the short term. Two options being considered for improved survivability include the use of AIM-9L missiles by RF-4s and increased use of two-ship formation tactics. If these two options are included in RF-4 air-to-air employment doctrine, the flying skills required by RF-4 crewmembers will change.

This paper will determine if current RF-4 training programs adequately teach the skills that RF-4 crewmembers would need if AIM-9Ls were added to the RF-4 and two-ship formation emphasized. If the training programs fall short, this paper will recommend alternatives.

The importance of matching training and employment doctrine cannot be overstated. Crewmembers must receive both upgrade and continuation training in the skills they are expected to utilize in combat. Employment doctrine defines the skills that are needed. If an AIM-9L is mounted on the aircraft, the crewmember must be thoroughly trained in its use. Failing to do so would compromise safety in peacetime and decrease combat capability/survivability in wartime.

Should the proposed RF-4 air-to-air employment doctrine be adopted, this paper can be used by Tactical Air Command (TAC) planners as a basis for making adjustments to current training programs.

The author wishes to thank Major Paul Freund, HQ TAC/DOTF and the staff of the Reconnaissance Weapons School at Gowen Field, Boise, ID. Their assistance in the development of the assumptions and limitations of the proposed RF-4 air-to-air doctrine made this paper possible.



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—ABOUT THE AUTHOR—

Major Drain received his Air Force commission through OTS after graduating from the University of New Mexico with a BA in Anthropology. He also holds an MS in Human Resources Management from Golden Gate University. After Undergraduate Navigator Training, he flew the RF-4 at Zweibrucken AB, West Germany and Bergstrom AFB, TX. He upgraded to Instructor Weapon Systems Officer (IWSO) and was one of the first to be checked out on the Tactical Electronic Reconnaissance and ARN 101 systems. He accumulated over 1000 hours in the RF-4 prior to his selection to attend Undergraduate Pilot Training. Upon graduation, Major Drain flew the F-15 at Langley AFB, VA and then became an AT-38 instructor at TAC's Lead-In Fighter Training course at Holloman AFB, NM. He accumulated over 1200 flying hours as a pilot in fighter aircraft. Major Drain has served in a variety of positions at squadron and wing level to include Squadron Training Officer, Squadron Safety Officer, Flight Commander, Wing Life Support Officer, and Chief, Wing Aircrew Training. He was an instructor pilot in air combat maneuvers, air combat tactics, low-altitude awareness training, and was a Wing Supervisor of Flying. During his tour as an AT-38 instructor, Major Drain was his squadron's Instructor of the Year for 1985 and squadron Air-to-Air Top Gun. Major Drain completed both Squadron Officer School and Air Command and Staff College (ACSC) by correspondence prior to attending ACSC in residence.

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EXECUTIVE SUMMARY

Part of our College mission is distribution of the students' problem solving products to DOD sponsors and other interested agencies to enhance insight into contemporary, defense related issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

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REPORT NUMBER

88-0780

AUTHOR(S)

MAJOR JOHN W. DRAIN, USAF

TITLE

FUTURE AIR-TO-AIR TRAINING FOR THE RF-4

I. Purpose: To develop an air-to-air training program for the RF-4 based on employment doctrine utilizing the AIM-9L and increased formation tactics.

II. Problem: In today's high threat environment, many options are being studied that would increase the RF-4's combat survivability. Two options being considered are employment of AIM-9Ls by the RF-4 and increased use of two-ship formation tactics. The addition of the AIM-9L and increased use of formation tactics would change the air-to-air flying skills required by RF-4 crewmembers. Current RF-4 training programs teach single-ship, defensive maneuvering skills. This paper identifies deficiencies in current RF-4 training programs and proposes solutions to address those deficiencies.

III. Data: The addition of the AIM-9L to the RF-4 and increased use of formation tactics would change the way the RF-4 employs in combat. This paper begins by defining the engagement philosophy for AIM-9L employment by the RF-4 both as a single-ship and in two-ship formations. From this philosophy, a proposed RF-4 air-to-air employment doctrine is developed. This doctrine is used to categorize the Basic Fighter Maneuvers (BFM) and Air Combat Maneuvers (ACM) the RF-4 crewmember would need to master. The current Lead-In Fighter Training (LIFT) syllabus and TAC's proposed LIFT syllabus are examined to determine if the air-to-air skills required of the RF-4 crewmember are being

CONTINUED

taught. The current RF-4 Operational Training Course (OTC) is examined to determine if the required BFM/ACM skills are being taught. An alternative RF-4 OTC syllabus is developed using the F-4 OTC syllabus as a guide. The F-4 OTC syllabus teaches both offensive and defensive BFM as well as ACM to both pilots and Weapon Systems Officers and therefore provides an excellent model for RF-4 OTC development. The resulting 13 sortie RF-4 OTC program adequately provides training in the skills required by the proposed air-to-air employment doctrine. Mission Qualification Training (MQT) and Continuation Training (CT) are examined to determine if BFM/ACM skills are adequately maintained. Additional sorties are recommended to meet training deficiencies.

IV. Conclusions: All current RF-4 training inadequately prepares the RF-4 crewmember in the offensive BFM and defensive ACM skills that would be needed if the RF-4 obtained the AIM-9L and increased the use of two-ship formation tactics. Tac's proposed LIFT syllabus would provide a solid foundation in both offensive and defensive BFM skills. An alternative RF-4 OTC syllabus can be developed, based on the F-4 OTC syllabus, that complements the proposed RF-4 air-to-air employment doctrine. Finally, RF-4 MQT and CT programs can maintain the RF-4 crewmember's air-to-air skills with the addition of offensive BFM profiles and increased emphasis on defensive ACM.

V. Recommendations: If the proposed RF-4 air-to-air employment doctrine is adopted, TAC planners should use this study as a guide to modify current upgrade syllabi and continuation training programs. Finally, further study should be made into additional academic and tactical formation training that would be required by the adoption of the proposed RF-4 air-to-air employment doctrine.

Chapter One

INTRODUCTION

BACKGROUND

Two major changes in employment lie on the horizon for the RF-4 reconnaissance aircraft. Tactical Air Command is presently exploring the concept of outfitting the RF-4 with the AIM-9L air-to-air missile. Uploading the AIM-9L on the RF-4 will have two major benefits. First, the added self-protection capability will make the RF-4 more survivable in today's high threat air arena. Second, training the RF-4 community in more advanced air-to-air skills today will make the transition to a follow-on RF, such as the RF-16, easier in the future (10:--). Although the addition of AIM-9Ls to the RF-4 gives the aircraft an obvious offensive capability, HQ TAC has emphasized that use of the new missiles will be strictly for defensive purposes (10:--). Captive missile trials of AIM-9Ls have been made on the RF-4 and deployment of the missile throughout the entire RF-4 fleet should occur in the future (11:--).

The second major change in RF-4 employment is an increased emphasis on two-ship operations. Many at the operator-level feel that the days of "Alone, Unarmed, and Unafraid" are gone due to today's high threat environment. While single-ship operations may be necessary at night or during periods of heavy tasking, flying as two-ship elements offers several advantages. Among these are increased visual mutual support, increased ECM capability, and redundancy in camera coverage (11:--).

Current training programs prepare the RF-4 crewmember for single-ship, defensive maneuvering when attacked by enemy aircraft. With the addition of the AIM-9L to the RF-4 and increased emphasis on two-ship tactics within the RF-4 community, the air-to-air maneuvering skills required of RF-4 crewmember have changed. Air-to-air training programs must keep pace with changes in employment doctrine. Crewmembers should not be expected to possess skills or perform maneuvers that they have not been taught. This paper will address the shortcomings that exist in current RF-4 air-to-air training programs. The addition of offensive maneuvering and increased emphasis on two-ship defensive maneuvering in RF-4 crewmember training programs should result in increased combat capability and increased safety during training.

ASSUMPTIONS

For this paper, the following assumptions are made:

1. The decision to outfit the RF-4 with the AIM-9L will be made. This

assumption is critical since the RF-4 crewmember would need no training in offensive maneuvering if the aircraft possessed no offensive capability. Current training programs would then require only minor changes to increase crewmember skills in two-ship maneuvering and emphasis would be placed solely on separation from the enemy as the way to "win" an air-to-air engagement (10:—).

2. Two-ship formation tactics will receive as much emphasis as single-ship tactics for daylight operations. This change in employment doctrine will force a shift in emphasis during training from single-ship to formation flying. This paper will only address the effect of two-ship operations on air-to-air training programs. Additional training in two-ship tactical maneuvering, formation flying, and target acquisition will not be addressed (11:—).

3. Tactical reconnaissance will remain the only mission of the RF-4. No training will be developed to give the RF-4 an "offensive" mission capability. Any use of AIM-9Ls would be strictly for defensive purposes (10:--).

4. Any new training programs must have minimal impact on training programs that exist today (10:--).

OVERVIEW

The remaining chapters of this paper will outline the air-to-air skills required of the RF-4 crewmember and determine a training program to develop and maintain those skills.

Chapter Two will outline a proposed RF-4 air-to-air employment doctrine based on the assumptions listed above. Defining employment doctrine is critical as a first step since the skills required by the RF-4 crewmember are dependent upon it. A training program can then be created to develop and maintain the new skills. The proposed employment doctrine will be developed using a common sense approach to air-to-air maneuvering. Air-to-air skills necessary for an effective training program will then be outlined.

Chapter Three will examine changes that must be made to formal syllabus training programs for RF-4 crewmembers due to the new skills required by the proposed RF-4 air-to-air employment doctrine. The current and proposed Lead-In Fighter Training syllabus will be examined. Then the current RF-4 Operational Training Course syllabus will be examined. It will be contrasted with the current F-4 OTC syllabus to determine the differences in air-to-air training that exist between RF-4 and F-4 upgrade syllabi. Finally, a new air-to-air training section will be developed for the RF-4 OTC syllabus.

After the RF-4 crewmember completes formal syllabus training, he must receive Continuation Training at the unit to maintain proficiency. Chapter Four will examine current RF-4 air-to-air CT requirements and determine their adequacy. Proposals for changes to CT requirements will be made.

The final chapter will summarize the air-to-air training program developed

in this paper. Topics for future research and discussion will be suggested. The paper will conclude with recommendations for implementation of the proposed air-to-air training program for the RF-4.

Chapter Two

PROPOSED RECONNAISSANCE AIR-TO-AIR EMPLOYMENT DOCTRINE

INTRODUCTION

Mounting AIM-9Ls on the RF-4 and adopting two-ship formation tactics will increase the survivability of the RF-4 in combat. With these changes, new flying skills will be required of RF-4 crewmembers. Before a training program can be developed to teach these new skills, they must be adequately defined. Answering how the AIM-9L will be employed by the RF-4 crewmember during single-ship and two-ship operations will help define the air-to-air skills that the crewmember needs. Only then can an effective training program to teach those skills be developed.

PRESENT AIR-TO-AIR EMPLOYMENT DOCTRINE

The motto "Alone, Unarmed, and Unafraid" aptly describes the current air-to-air employment doctrine of the RF-4 community. With no offensive weapons capability, emphasis has been solely on defensive maneuvering. The RF-4 crewmember must visually acquire the enemy, assess the threat, negate the threat while maintaining maneuvering potential, separate from the enemy, and continue the mission (3:6-3; 7:41). All RF-4s, except those with data-link capability, must return home with film intact for their missions to be considered successful. Avoiding conflict and disengaging when conflict occurs are the underlying themes of RF-4 air-to-air philosophy. With this defensive air-to-air doctrine, the skills that RF-4 crewmembers must master are limited to defensive Basic Fighter Maneuvers. These maneuvers include defensive turns extensions, scissors, guns jinkouts, and separations (6:5-11). The crewmember must recognize the attack as either a missile or guns attack, apply the appropriate BFM and separate after negating the attack. Help from another cannot be expected since most missions are planned to be flown single-ship and the RF-4 currently has no offensive capability.

PROPOSED AIR-TO-AIR EMPLOYMENT DOCTRINE

With the increased lethality of enemy surface-to-air and air-to-air threats during the 1980s, the single-ship, unarmed mission of the RF-4 is viewed as increasingly less survivable (11:--). Measures being considered that would enhance RF-4 survivability include arming the RF-4 with AIM-9L missiles and tasking RF-4s to fly as two-ships. At present, any changes to RF-4 air-to-air employment doctrine are in the conceptual stage at TAC. Two points continue to be emphasized, however. The RF-4's only mission will

continue to be tactical reconnaissance and the AIM-9L will be used to enhance the defensive capability of the aircraft (10:—).

For the purposes of this paper it is assumed that, when tasking allows, the basic RF-4 fighting unit is changed from the single-ship to the two-ship. Two aircraft flying in tactical formation can provide visual mutual support, increased electronic jamming, assistance in navigation, and redundancy in cameras for each other. With AIM-9Ls on board, a formation of RF-4s may deter attack by an enemy. If one of the RF-4s is attacked, the remaining RF-4 could turn to bring AIM-9Ls to bear against the enemy. This concept of mutual support is fundamental to increasing the survivability of the RF-4 in the air-to-air arena.

The following two illustrations show how a two-ship of RF-4s could defeat an attack from an enemy aircraft by killing the enemy using the AIM-9L (1:7-18,7-20). In both examples the BFM of the attacking enemy aircraft determines which RF-4 is threatened and which RF-4 is in a position to employ the AIM-9L. Figure 1 depicts an enemy aircraft attacking the right-hand RF-4. The enemy aircraft presses his attack against the same RF-4 and is shot by the left-hand RF-4. Both RF-4s are then able to execute a successful separation. In figure 2, the enemy aircraft initially attacks the right-hand RF-4 and switches to the left-hand RF-4 to avoid being shot. As the engagement continues, the right-hand RF-4 is able to shoot the enemy aircraft and direct a successful separation.

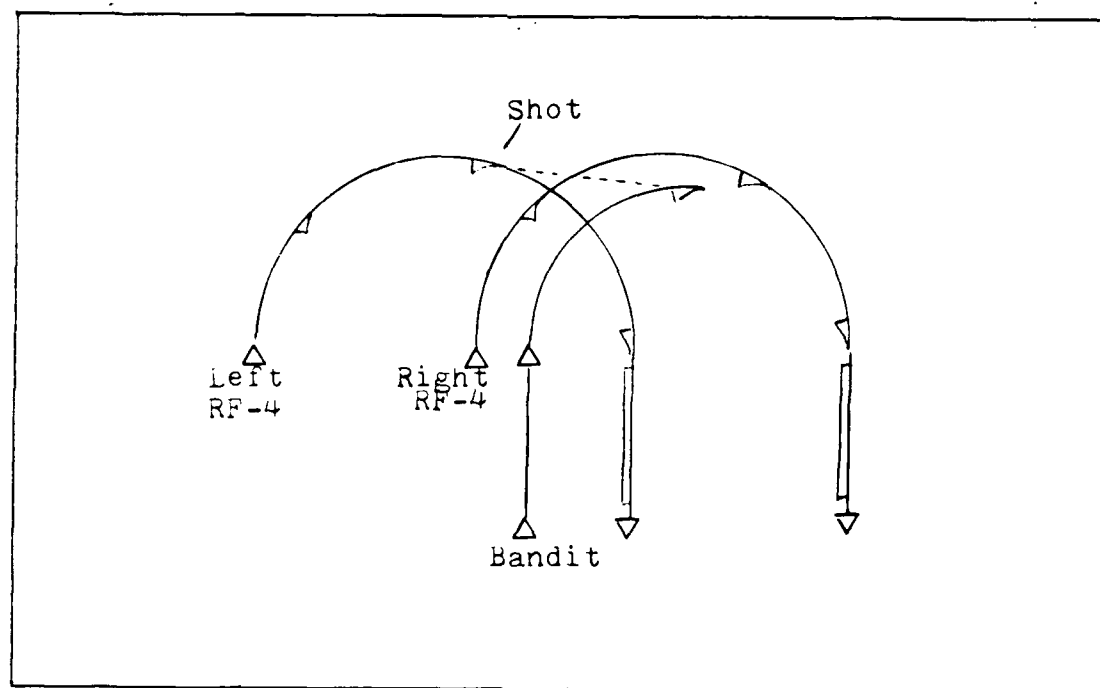


Figure 1—Air Combat Maneuvers, No Bandit Switch

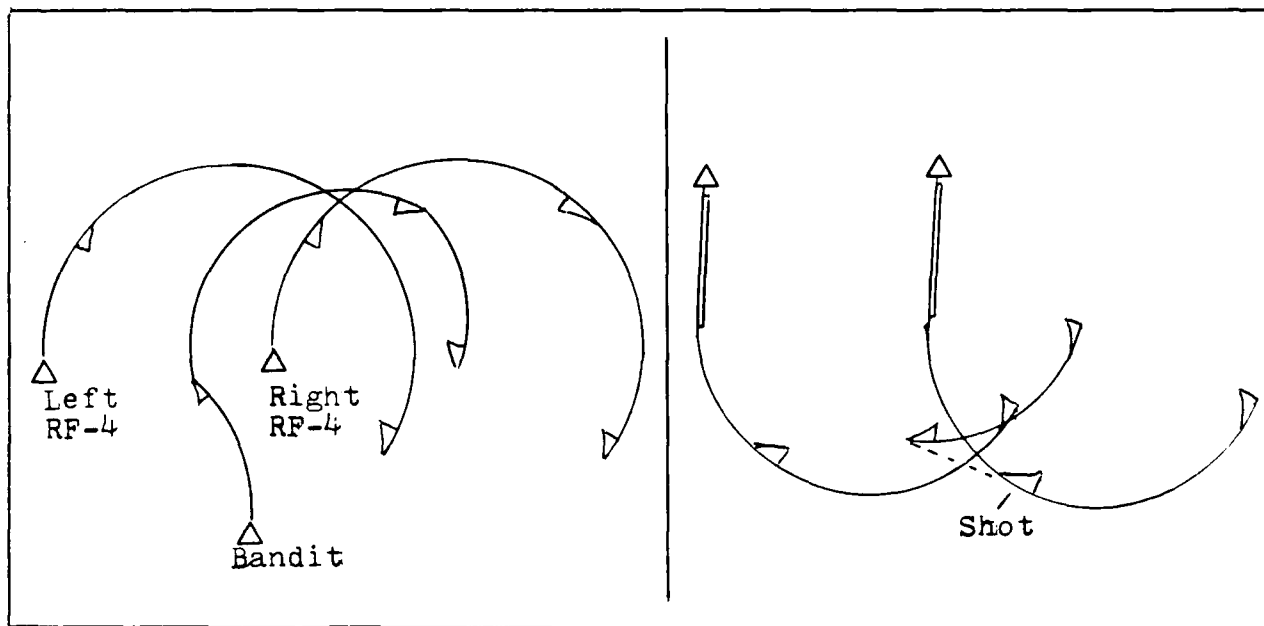


Figure 2--Air Combat Maneuvers, Bandit Early Switch

The AIM-9L can enhance the survivability of the single-ship as well as the two-ship RF-4 formation. If an enemy aircraft attacking a lone RF-4 does not control his rate of closure and flies in front of the RF-4, an offensive/kill option now exists where in the past only a separation option existed. The same offensive/kill option would exist for the RF-4 crewmember if in a neutral or scissors situation. It is important to emphasize that in these situations the RF-4 would start the engagement in a defensive position and would use the offensive capability of the AIM-9L to favorably end the engagement. With increased enemy front-quarter ordnance employment, the RF-4 could use the AIM-9L preemptively against enemy aircraft in the front-quarter. Shots would only be taken if the enemy aircraft is perceived to be a potential threat and the shot could be taken without going significantly off the route of flight.

TYPES OF BFM TRAINING NEEDED

Once situations where the AIM-9L can be used by single-ship and two-ship RF-4s are defined, the requisite BFM skills to employ the RF-4 in the air-to-air arena can be determined. The RF-4 air-to-air training program can then be examined to see if these skills are being adequately taught and suggestions for improvement can be made.

With the addition of the AIM-9L to the RF-4, the required defensive BFM skills would undergo only minor changes. In addition to the separation, the offensive/kill option would have to be taught for RF-4 crewmembers who find themselves in a neutral/scissors situation or fighting an overshooting adversary.

To use the AIM-9L effectively, a basic understanding of offensive BFM is required. Although the AIM-9L can be employed from any aspect, more offensive skills are needed beyond simply knowing how to point and shoot (1:4-1 - 4-15). Control of excessive closure is required to prevent regression from offense to defense. To keep this regression from occurring, aircrews must learn BFM skills needed to execute the high yo-yo and quarter plane maneuver. If increased closure rate is necessary for missile employment, a low yo-yo must be performed. An understanding of the effects that aspect and heading crossing angles have on closure, especially during pure pursuit attacks, should be fundamental to RF-4 offensive training since the AIM-9L on the RF-4 would be employed simply by pointing at the enemy. Only skills in low to medium aspect (behind the enemy aircraft's wing line) offensive BFM would be required. If a front-quarter/high aspect shot presented itself, a separation maneuver would be appropriate unless a quick kill could be accomplished prior to separation. Very close offensive maneuvering need not be taught since it is only appropriate for a guns offense rather than a missile offense and the RF-4 does not have a gun.

Two-ship defensive maneuvering skills, known as defensive air combat maneuvers, are required if the basic fighting element becomes a two-ship formation. Defensive ACM should emphasize separation as the desired engagement outcome. If enemy maneuvers prohibit separation, every effort must be made by the RF-4 not directly engaged by the enemy to quickly effect a kill using offensive maneuvering. Good communication and maximum performance flying are critical to success in ACM.

SUMMARY

The proposed air-to-air employment doctrine for the RF-4 uses offensive maneuvering only as a means of enhancing defense. With the addition of the AIM-9L, RF-4 crewmembers must be proficient in offensive as well as defensive BFM skills. Increased use of two-ship formations will require high levels of proficiency in defensive ACM. High aspect offensive BFM, beyond point, shoot, and separate would not be appropriate for the RF-4. Emphasis should always remain on avoiding engagement with the enemy. However, if an RF-4 is threatened, the attack should be negated as quickly as possible through the use of defensive BFM or offensive BFM and employment of the AIM-9L.

Chapter Three

FORMAL SYLLABUS TRAINING

INTRODUCTION

After graduation from Undergraduate Pilot or Navigator Training, the upgrading RF-4 crewmember attends two formal syllabus courses. The first course is LIFT at Holloman AFB, NM. There, the crew receives instruction in basic fighter skills in the AT-38B aircraft (6:1-1). Upon graduation from LIFT, the crew goes to Bergstrom AFB, TX for the RF-4 Operational Training Course. During the course, the crew learns how to fly the RF-4 and achieves basic proficiency in all aspects of the tactical reconnaissance mission (9:1-1). Following graduation, the crew is assigned to an operational unit and, after a short top-off program, is declared Mission Ready.

LIFT SYLLABUS TRAINING

The reconnaissance course (R-category) is made up of sorties that are "borrowed" from the core LIFT course. Students receive simulator orientation (SIM), transition training (T), basic and tactical formation (F) training, defensive BFM (B) training, and navigation (N) training. On BFM sorties, two aircraft, each with a student pilot (P) and an instructor pilot (IP), fight against one another. During defensive BFM sorties the students take turns being on the defensive. The offensive role during these engagements is always flown by the IP in the attacking aircraft. R-category students fly one offensive sortie (B-1F). This sortie is for familiarization only with no level of proficiency required in the offensive BFM tasks. The ride is included to give the student a better appreciation for the problems an attacking aircraft must solve during an engagement. This knowledge should enhance the student's ability to perform defensive BFM tasks. The single offensive ride inadequately trains the student in the offensive BFM skills required by the proposed air-to-air employment doctrine. One navigation sortie can be flown with an Instructor Weapon Systems Officer (IWSO). The following table outlines current R-category requirements at LIFT (6:2-17 - 2-19).

<u>Mission Number</u>	<u>Crew</u>	<u>Mission Description</u>
SIM-1R SIM-1	P/IP P/IP	Practice/review checklist and emergency procedures. "
T-1	P/IP	Aircraft and area orientation.
T-2	P/IP, P/IP	Practice basic formation and area orientation.
F-2	P/IP, P/IP P/IP, P/IP	Practice basic four-ship formation. Practice two- ship tactical formation.
F-3	"	"
F-4	"	"
B-1F	P/IP, P/IP	Familiarization with offensive BFM.
B-4	P/IP, P/IP	Practice defensive BFM.
B-5	"	"
B-6	"	Demonstrate proficiency in defensive BFM.
N-2	P/IP, P/IP	Practice low-level navigation and low altitude formation maneuvering.
N-3	P/IP, P/IP or P/IWSO	"

Table 1--Current LIFT R-Category Syllabus

The TAC-approved draft to the LIFT syllabus, dated 30 Sept 87, radically changes the direction of R-category training. This proposed syllabus would place just as much emphasis on learning offensive BFM skills as learning defensive skills. Essentially, the R-category student would be required to take the same basic core sortie requisites as other LIFT students. Proficiency would be required in offensive and defensive maneuvers from positions of low aspect. This would provide an excellent introduction to the types of maneuvering required by the proposed RF-4 air-to-air employment doctrine. Simulator training would be taught by a qualified simulator instructor (SI) rather than an instructor pilot. Opportunities would exist for the student to fly solo or with an observer (X) in the rear cockpit. The following table outlines TAC's proposed R-category syllabus training at LIFT (2:2-10,2-11, 2-18).

<u>Mission Number</u>	<u>Crew</u>	<u>Mission Description</u>
SIM-1R	P/SI	Practice/review checklist and emergency procedures.
SIM-1	"	"
SIM-2	"	To review/practice instrument procedures.
SIM-3	"	"
T-1	P/IP, P/IP	Practice aircraft/area orientation and basic two-ship formation.
I-1	IP/P	Review and practice instrument procedures.
I-2	"	"
F-1	P/IP, P/IP	Practice two-ship basic formation and introduce two-ship tactical formation.
F-2	P/IP, P/IP	Practice four-ship basic formation and two-ship tactical formation.
F-3	"	"
F-4	P/IP, P/X	Demonstrate proficiency in basic and tactical formation.
F-5	P/IP, P/X	"
B-1	P/IP, P/IP	Practice offensive BFM versus limited defender.
B-2	"	"
B-3	P/IP, IP/X	"
B-4	P/IP, P/IP	Practice defensive BFM versus limited attacker.
B-5	"	"
B-6	P/IP, IP/X	"
B-7	P/IP, P/IP	Demonstrate proficiency in offensive and defensive BFM versus limited adversary.
B-8	P/IP, P/IP	Practice fluid offense and defense versus limited adversary.
N-1	P/IP or P/IWSO	Practice low-level navigation.
N-2	P/IP, P/IP or P/IWSO	Practice low-level navigation and low altitude formation maneuvering.

Table 2--TAC's Proposed LIFT R-Category Syllabus

Weapon Systems Officer (WSO) training at LIFT will not be discussed in this paper. Because of limited available sorties in the rear cockpit of the AT-38B, the WSO course at LIFT cannot be expanded much beyond familiarization with basic BFM concepts. Though limited in scope, the author feels the current LIFT WSO syllabus adequately meets the needs of student WSOs.

The current R-category LIFT syllabus would fail to meet the training needs of future RF-4 crewmembers under the proposed RF-4 air-to-air employment doctrine. Students would arrive at Bergstrom AFB for the OTC without a foundation in offensive maneuvering. Basic offensive skills are best taught at LIFT due to instructor expertise and relative ease of sortie generation. TAC's proposed R-category LIFT syllabus would adequately meet the offensive and defensive training needs of the future RF-4 crewmember.

RF-4 OPERATIONAL TRAINING COURSE

The current RF-4 OTC syllabus would inadequately train RF-4 crewmembers in the BFM skills required by the proposed change in RF-4 air-to-air employment doctrine. Emphasis in the course is placed on single-ship, defensive maneuvering. Offensive BFM skills and two-ship defensive Air Combat Maneuvers are not taught. Student experience in the high-G maneuvering environment at LIFT is not taken into account, as evidenced by the heavy emphasis on Aircraft Handling Characteristics (AH) sorties in the course. Pilots and WSOs receive separate sorties in Defensive Maneuvering (DM). No attempt is made to allow crewed training in BFM skills. The following table outlines the air-to-air training section of the current RF-4 OTC (9:5-4 - 5-7,5-13,5-14).

<u>Mission Number</u>	<u>Crew</u>	<u>Mission Description</u>
AH-1	P/IP	Practice Aircraft Handling Characteristics (AHC) Maneuvers.
AH-2	"	"
AH-3	P/IP, P/IP	Practice AHC maneuvers and formation flight.
AH-4	"	"
AH-5	IP/WSO, IP/WSO	Introduce stall recoveries, maximum performance turns, confidence maneuvers, and aerobatics.
DM-1	P/IP, IP/IWSO or IP/WSO	Practice defensive BFM and formation flight.
DM-2	"	"
DM-3	"	"
DM-4	IP/WSO, IP/IWSO or IP/WSO	Practice defensive BFM.
DM-5	"	"

Table 3--Current RF-4 OTC Air-To-Air Training

In redesigning the RF-4 OTC syllabus to reflect training in the BFM skills required by the proposed change in RF-4 air-to-air employment doctrine, examination of the F-4 OTC syllabus can prove useful. With the exception of the F-4's slats, both the RF-4 and F-4 airframes are basically the same. In all but the slow speed arena, their air-to-air maneuvering characteristics are similar. Therefore, it should take basically the same amount of time to learn a particular BFM maneuver in one aircraft as in the other. If sortie profiles were made the same in both courses, the number of sorties to teach a particular task would be the same. The F-4 OTC syllabus teaches all the BFM skills required by the proposed change in RF-4 air-to-air employment doctrine. Thus, a comparison can be made between the RF-4 OTC syllabus and the F-4 OTC syllabus to determine where the RF-4 syllabus falls short. Additionally, the F-4 OTC syllabus is the only TAC syllabus that provides guidance on how the training of pilots and WSOs in air-to-air BFM skills can be interfaced. No other aircraft in the inventory with a pilot/WSO crew receives extensive BFM training during the OTC.

The F-4 OTC syllabus provides training in a wide variety of skills during the BFM phase. The phase begins with a tactical formation/AHC sortie. This sortie, along with a transition (TR) sortie containing AHC events, better prepares the student for BFM maneuvering. The course progresses from offensive through counteroffensive (defensive) short range BFM. Then the student is trained in longer range BFM that begins from the front-quarter. During the BFM phase, radar intercepts (AI) are practiced. Ultimately students are able to perform a radar intercept on an adversary aircraft and then employ appropriate short or long range BFM once in the visual arena. The following table outlines the BFM phase of the current F-4 OTC syllabus (8:5-10 - 5-14).

<u>Mission Number</u>	<u>CREW</u>	<u>Mission Description</u>
BFM-1	P/IP, P/IP	Practice tactical formation and AHC maneuvers.
AI-1	IP/WSO, IP/WSO	Practice cutoff radar intercepts.
BFM-2	IP/WSO, P/IP	Introduction to offensive BFM.
BFM-3	IP/WSO, P/IWSO	Pilot- practice offensive BFM. WSO- practice counteroffensive BFM.
BFM-4	"	Pilot- demonstrate proficiency in offensive BFM. WSO- practice counteroffensive BFM.
BFM-5	IP/IWSO, P/WSO	Crew solo- demonstrate proficiency in offensive BFM.
AI-2	IP/WSO, IP/WSO	Practice stern radar conversions.
BFM-6	IP/WSO, P/IP	Pilot- practice counteroffensive BFM. WSO- practice offensive BFM.
BFM-7	IP/WSO, P/IWSO	"

Table 4—Current F-4 OTC BFM Training

BFM-8	IP/IWSO, P/WSO	Crew solo- demonstrate proficiency in counter-offensive BFM.
AI-3	IP/WSO, IP/WSO	Practice tactical intercepts.
BFM-9	IP/WSO, P/IP	Introduce long range, high aspect BFM.
BFM-10	IP/WSO, P/IWSO	Practice long range, high aspect BFM.
BFM-11	IP/IWSO, P/WSO	Practice tactical intercept and long range, high aspect BFM.
BFM-12	IP/IWSO, P/WSO	Crew solo- demonstrate proficiency in tactical intercepts and long range, high aspect BFM.
BFM-13	"	Crew solo- demonstrate proficiency in tactical intercepts and long range, high aspect BFM. Practice long range, counteroffensive BFM.

Table 4, Continued—Current F-4 OTC BFM Training

The F-4 OTC syllabus contains five Air Combat Maneuvers training sorties. During these sorties, two aircraft flown by students fight against a single adversary aircraft flown by an instructor. Both offensive and defensive engagements are flown. Heavy emphasis is placed on formation tactics, mutual support, and teamwork. The following table outlines the ACM phase of current F-4 OTC syllabus training (8:5-15 - 5-16).

<u>Mission Number</u>	<u>Crew</u>	<u>Mission Description</u>
ACM-1	IP/WSO, P/IP, P/IP	Practice offensive ACM.
ACM-2	IP/WSO, P/IWSO, P/IWSO	Practice offensive ACM.
ACM-3	IP/WSO, P/IP, P/IP	Practice defensive ACM.
ACM-4	IP/WSO, P/WSO, P/IWSO	Practice defensive ACM.
ACM-5	"	"

Table 5—Current F-4 OTC ACM Training

With the proposed RF-4 air-to-air employment doctrine in mind, an examination of the F-4 OTC syllabus reveals which sorties could be used in a revised RF-4 OTC syllabus. The proposed RF-4 air-to-air employment doctrine stresses offensive and defensive BFM skills from low aspect (behind the enemy) and defensive ACM skills. Therefore, several F-4 OTC sorties would not be necessary. Since the RF-4 would not be performing radar intercepts, AI-1, AI-2, and AI-3 are not needed. The high aspect BFM taught on B-9 through B-13

would not be needed because RF-4 air-to-air doctrine stresses separation if the enemy is met in the front-quarter. Additionally, ACM-1 and ACM-2 would not be needed in the RF-4 OTC because the RF-4 crewmember would only need to know defensive ACM. The remaining sorties from the F-4 OTC syllabus that teach the skills required by the RF-4 crewmember are outlined in the following table.

<u>Mission Number</u>	<u>Crew</u>	<u>Mission Description</u>
BFM-1	P/IP, P/IP	Practice tactical formation and AHC maneuvers.
BFM-2	IP/WSO, P/IP	Introduction to offensive BFM.
BFM-3	IP/WSO, P/IWSO	Pilot- practice offensive BFM. WSO- practice counteroffensive BFM.
BFM-4	"	Pilot- demonstrate proficiency in offensive BFM. WSO- practice counteroffensive BFM.
BFM-5	IP/IWSO, P/WSO	Crew solo- demonstrate proficiency in offensive BFM.
BFM-6	IP/WSO, P/IP	Pilot- practice counteroffensive BFM. WSO- practice offensive BFM.
BFM-7	IP/WSO, P/IWSO	"
BFM-8	IP/IWSO, P/WSO	Crew solo- demonstrate proficiency in counter-offensive BFM.
ACM-3	IP/WSO, P/IP, P/IP	Practice defensive ACM.
ACM-4	IP/WSO, P/WSO, P/IWSO	Practice defensive ACM.
ACM-5	"	"

Table 6--F-4 OTC BFM/ACM Sorties; Modified for RF-4

The sorties in Table 6 would provide training in the skills needed by RF-4 crewmembers according to the proposed change in RF-4 employment doctrine. With minor adjustments, training efficiency can be optimized by changing some crew compositions and mission descriptions. First, it should be noted that the current RF-4 OTC syllabus contains five AHC sorties while the F-4 OTC syllabus contains one transition sortie with AHC events and one dedicated AHC sortie. With RF-4 crewmembers attending LIFT, the heavy emphasis on AHC is probably not justified. Maintaining two AHC sorties for pilots and one AHC sortie for WSOs should be a reasonable warm-up for the maneuvering required in BFM and ACM. The F-4 OTC requires the pilot to demonstrate proficiency in offensive BFM (B-5) after three practice rides and demonstrate proficiency in counteroffensive BFM (B-8) after two practice rides. Additionally, the pilot would be trying to demonstrate proficiency on B-5 with a student WSO in his rear cockpit who may or may not have seen any offensive maneuvering since LIFT. Training would be enhanced if the students had two practice rides prior to demonstrating proficiency in both offensive and defensive BFM. Both "demo-proficiency" sorties should be flown with instructors in each aircraft to

determine if the BFM skills had truly been learned. The confidence-building, crew-solo ride should be flown after both the pilot and WSO have seen all BFM events with an instructor. In ACM the crew composition should be changed to allow more control of the two-ship element. With an IP in the element as well as the attacking aircraft, a margin of safety would be added and there would be no doubt as to who was in charge of the element. WSOs would be required to fly one sortie in the attacking aircraft prior to flying in the element. Flying three ACM sorties would allow the pilots to fly their first sortie with IPs and their crewed WSOs to fly one sortie with the attacker and one sortie in the element. The result of these changes is an air-to-air training program that efficiently meets the requirements of the proposed change in RF-4 employment doctrine. The proposed air-to-air section of the RF-4 OTC syllabus is outlined in the following table.

<u>Mission Number</u>	<u>Crew</u>	<u>Mission Description</u>
AHC-1	P/IP, P/IP	Practice tactical formation and AHC maneuvers.
AHC-2	"	"
AHC-3	IP/WSO, IP/WSO	"
BFM-1	IP/WSO, P/IP	Pilot- practice offensive BFM.
BFM-2	IP/WSO, P/IWSO or P/IP	WSO- practice counteroffensive BFM.
BFM-3	"	Pilot- demonstrate proficiency in offensive BFM.
BFM-4	IP/WSO, P/IP	WSO- practice counteroffensive BFM.
BFM-5	IP/WSO, P/IWSO or P/IP	Pilot- practice counteroffensive BFM.
BFM-6	"	WSO- practice offensive BFM.
BFM-7	IP/IWSO, P/WSO	Pilot- demonstrate proficiency in counteroffensive BFM. WSO practice offensive BFM.
ACM-1	IP/WSO, P/IP, P/IP	Crew solo- demonstrate proficiency in offensive and counteroffensive BFM.
ACM-2	IP/WSO, P/IP, P/WSO	
ACM-3	IP/IWSO, P/IP, P/WSO	

Table 7--Proposed RF-4 OTC Air-To-Air Training

SUMMARY

Implementation of the proposed LIFT and RF-4 OTC syllabi would teach the BFM skills required by the proposed change in RF-4 air-to-air employment doctrine. The current Lift syllabus proves inadequate due to its emphasis on defensive BFM. The RF-4 OTC syllabus is also lacking in offensive BFM training as well as in counteroffensive ACM training. TAC's proposed R-category changes to the LIFT syllabus would successfully lay the necessary foundation in both offensive and defensive/counteroffensive BFM skills. A comparison of the RF-4 OTC syllabus with the F-4 OTC syllabus reveals that it is possible to develop a training program in offensive BFM, counteroffensive BFM, and ACM that meets the needs of the RF-4 community. The air-to-air program outlined in Table 7 provides this training in the fewest possible sorties. Having successfully completed the OTC the RF-4 crewmember would progress to his operational unit with an understanding of the BFM and ACM skills necessary to fly, fight, survive, and ultimately accomplish his mission.

Chapter Four

MISSION QUALIFICATION AND CONTINUATION TRAINING

INTRODUCTION

Two types of RF-4 air-to-air training remain to be discussed. Mission Qualification Training prepares the RF-4 crewmember to perform the wartime mission of his operational unit. Continuation Training allows the crewmember to maintain these wartime skills through daily training based on a 6-month training plan. Like any other flying skills, the air-to-air skills learned during OTC can be lost through lack of use. The RF-4 crewmember, according to the proposed RF-4 air-to-air employment doctrine, must be capable of performing both offensive and defensive BFM and two-ship ACM. A successful CT program will maintain air-to-air skills without detracting from training in reconnaissance, the RF-4's primary mission (4:6-17).

MISSION QUALIFICATION TRAINING

After the RF-4 crewmember arrives at his operational unit he must upgrade to Mission Ready status. This upgrade, called Mission Qualification Training, is used to familiarize the crewmember with the peculiarities of the unit's mission and ensure that skills taught during the OTC have not been lost. While the majority of MQT sorties must concentrate on reconnaissance, it would be prudent to retain sorties to practice AHC, BFM, and ACM. These air-to-air sorties allow the gaining unit to assess the crewmember's ability to survive in today's high threat environment and accomplish the mission. Successful completion of MQT allows the crewmember to enter the CT program.

The current MQT program continues to reflect the emphasis on single-ship, defensive air-to-air maneuvering taught in the RF-4 OTC. The MQT program consists of three mandatory sorties that evaluate the crewmember's skills in AHC, defensive BFM, and defensive combat tactics respectively. One optional defensive ACM sortie can be flown if desired. All sorties use mission profiles from TACR 55-79 (5:A1-2,A1-3).

To evaluate the crewmember's ability in all skills required by the proposed RF-4 air-to-air employment doctrine, an offensive BFM and mandatory ACM mission should be added to the current MQT program. Upon completion of MQT the crewmember would be certified as "crew attack and defend" and "crew formation defend" qualified by the squadron commander. The crewmember would then be able to enter the CT program.

CONTINUATION TRAINING

CT programs allow the RF-4 operational crewmember to maintain necessary wartime skills by requiring him to practice these skills on a periodic basis. While most training requirements relate to the reconnaissance mission, some sorties are set aside for maintaining air-to-air proficiency. Currently, the RF-4 crewmember is required to fly six Air Combat Tactics (ACBT) sorties every training half (six months) to maintain minimum proficiency. Two of these must be AHC sorties flown with an ACBT IP (5:3-1). The remaining four sorties can include defensive BFM, defensive ACM, defensive combat tactics, or element defensive combat tactics scenarios (5:A1-3,A1-4).

The skills required by the proposed RF-4 air-to-air doctrine could be maintained if the scenarios were expanded to include offensive BFM. ACM should receive emphasis in proportion to the amount of two-ship wartime tasking expected by the unit. A total of six ACBT sorties per half appears to be adequate for maintaining basic proficiency. Six ACBT sorties per half, minimum, are required of all crewmembers in TAC fighters (4:6-46). More air combat training could be obtained if the requirement for two AHC sorties were reduced to one. A typical unit program might require one AHC sortie, three BFM (both offensive and defensive) sorties, and two ACM sorties to maintain basic proficiency.

SUMMARY

The MQT and CT programs fail to maintain the skills required by the proposed change in RF-4 air-to-air employment doctrine. Both programs emphasize single-ship, defensive maneuvering skills. The MQT program should include offensive BFM and mandatory ACM profiles. The current CT program should have offensive BFM added to the list of required scenarios for training. Six ACBT sorties per half would adequately maintain the RF-4 crewmember's air-to-air skills.

Chapter Five

SUMMARY

INTRODUCTION

The future of the RF-4 community will be characterized by dynamic change. While discussions continue on the fate of a follow-on reconnaissance fighter, the RF-4 continues to undergo modifications and improvements. Proposals for the addition of air-to-air missiles and increased emphasis on formation tactics would make tactical reconnaissance a more survivable mission. Training programs must keep pace with operational requirements to ensure RF-4 crewmembers possess the skills needed to perform their mission. This paper addressed the changes to RF-4 crewmember training required if the RF-4 were to receive AIM-9Ls and increasingly employ in two-ship formations during combat.

CONCLUSIONS

1. The addition of the AIM-9L and increased emphasis on two-ship formation versus single-ship tactics will change RF-4 air-to-air employment doctrine.
2. The proposed RF-4 air-to-air employment doctrine will demand new skills of RF-4 crewmembers. Crewmembers will have to be proficient in offensive as well as defensive BFM and place more emphasis in training on defensive ACM.
3. Current formal syllabus courses inadequately prepare RF-4 crewmembers in needed BFM/ACM skills. LIFT and the RF-4 OTC emphasizes the skills needed under the old employment doctrine of defensive, single-ship operations.
4. TAC's proposed (draft) LIFT syllabus meets the training needs of the proposed change in RF-4 air-to-air employment doctrine.
5. The F-4 OTC syllabus can be used as a basis for developing a new RF-4 OTC syllabus that adequately teaches the required BFM/ACM skills.
6. The current continuation training program would inadequately maintain the BFM/ACM skills required by the proposed change in RF-4 air-to-air employment doctrine.
7. Offensive BFM should be added to current CT scenarios. Increased emphasis should be placed on defensive ACM.

RECOMMENDATIONS

1. Further studies should be made to address the following questions:
 - a. What additional training would be required by the proposed RF-4 employment doctrine in tactical formation flying skills at high, medium, and low altitudes?
 - b. What modifications to academic training programs would be required by the adoption of this paper's proposed air-to-air training program? Additional academic training would be needed in BFM/ACM and munitions principles, preflight, and employment.
2. If the proposed RF-4 air-to-air employment doctrine is adopted, TAC planners should use this study as a guide for modifying current upgrade syllabi and continuation training programs. The days of "Alone, Unarmed, and Unafraid" tactical reconnaissance fighters are numbered in today's sophisticated, high-threat air arena. With increased formation tactics, offensive firepower, and appropriate, realistic training, tactical reconnaissance can be an increasingly viable and survivable mission.

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GLOSSARY

ACM	Air Combat Maneuvers
AH	Aircraft Handling Characteristics
AHC	"
AI	Air Intercept
AIM	Air Intercept Missile
B	Basic Fighter Maneuvers
BFM	"
CT	Continuation Training
DM	Defensive Maneuvering
F	Formation
I	Instrument
IP	Instructor Pilot
IWSO	Instructor Weapon Systems Officer
LIFT	Lead-In Fighter Training
MQT	Mission Qualification Training
N	Navigation
OTC	Operational Training Course
P	Pilot
SI	Simulator Instructor
SIM	Simulator
T	Transition
TAC	Tactical Air Command
TR	Transition
WSO	Weapon Systems Officer
X	Observer

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